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hydrated form of cellulose, and is found in *L. saccharina* and *L. digitata* in various states of hydration. It appears to be produced in the young sieve plates by the action of a ferment on the already formed cell wall, but is afterward accumulated by deposition from the protoplasm, both on the surface of the sieve plate and on the lateral walls of the tube. (4) The histology of the sieve tubes agrees with that of spermatophytes. The only contrast between the method of obliteration of the sieve tubes in Laminariaceae and Pinus is that in the latter the heads of the slime strings are still visible on the free edge of the callus cushions, and the path of the slime strings can be traced throughout the callus mass; while in Macrocystis and Laminaria the callus is laid down by the protoplasm of the sieve tubes over the heads of the slime strings, so that they are buried by the overlying callus and no perforations can be traced through the rod. (5) The protoplasmic connecting threads throughout the tissue of *M. pyrifera* and *L. saccharina* were demonstrated, but it is impossible to be certain of their formation in case of secondary attachment.—S. YAMANOUCHI.

Primitive angiosperms.—Miss SARGENT has developed more fully her view as to the origin of the monocotyledons,[15] which was stated formally in 1903. The present paper of course deals with the characters of primitive angiosperms, but this is a necessary corollary to the recently developed phylogenetic position of monocotyledons. It is an abstract of a course of eight lectures delivered for the London University about a year ago, and even then leaves the discussion of the origin of the flower to the recent paper by ARBER and PARKIN.[16] It is impossible to discuss the numerous lines of evidence presented and the inferences drawn from them. In general it may be said that facts are treated with a free hand and not always critically, that they are often related to one another with great boldness, and that the conclusions are in some cases more evident than the proofs.

Reasons for believing in the monophyletic origin of angiosperms are first presented, and with the recent development of our knowledge of vascular anatomy, it is questionable whether there exists today any serious objection to this view. And yet, perhaps it is well to have the situation summarized for us.

The reconstruction of the primitive race of angiosperms is based chiefly upon floral structure, stem anatomy, and number of cotyledons. The outcome is a plant with a strobiloid flower (as Magnolia), with a cambium, and with two cotyledons. A comparative study of pteridophytes, gymnosperms, and angiosperms would seem to make the last two conclusions inevitable, and the first at least partially true.

The real contention of the author, however, is the origin of the monocotyledonous condition. There is a very full discussion of all possible alternatives, and the conclusion reached is that the fusion hypothesis is the most tenable; that is, the two lateral cotyledons of primitive angiosperms have become phylogenetically fused in monocotyledons, and the result appears as a terminal member. The anatomical proofs of this position are fairly well known and seem cogent. The final question asked is as to the cause of fusion, and the answer is, the geophilous habit of the primitive monocotyledons. The author recognizes the fact that there are other distinctive features of monocotyledons which geophily cannot be called upon to explain, but these are "departures from the primitive type."

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[15] SARGENT, ETHEL, The reconstruction of a race of primitive angiosperms. Annals of Botany **22**:121–186. *figs. 21.* 1908.

[16] ARBER, E. A. N., and PARKIN, J., On the origin of angiosperms. Jour. Linn. Soc. Bot. **38**:29–80. 1907. See BOT. GAZETTE **44**:389. 1907.

To boil it all down: the angiosperms are monophyletic; the monocotyledons are derived from the primitive dicotyledonous stock; the terminal "cotyledon" is a historical fusion of two lateral cotyledons, which was induced by geophily; and the other characters of monocotyledons remain to be explained.—J. M. C.

Polar conjugation in angiosperms.—Recently[17] PORSCH attempted to explain the embryo sac and double fertilization in angiosperms. He holds that the two synergids are homologous with the neck canal cells of the gymnosperm archegonium (as to what gymnosperm has two neck canal cells, we are left in doubt); that the oospheres of gymnosperms and angiosperms are homologous; that the upper polar nucleus is homologous with the ventral canal cell of the gymnosperm archegonium; and that the antipodal end of the angiosperm sac is the equivalent of the micropylar end. The triple fusion results from the essentially female character of the polars.

It is with considerable surprise that we find an observer so acute as SCHAFFNER[18] writing that the view of PORSCH in regard to these homologies has much in its favor, and that his interpretation of the triple fusion seems correct. That the eggs of gymnosperms and angiosperms are homologous, no one denies; but the other homologies are so inaccurate that to note them at all seems useless. In following the reduction of the archegonium, one notes in the bryophytes a shortening of the neck and a diminution in the number of neck canal cells. In the lower Filicineae there are two neck canal cells separated by a wall; in the higher Filicineae there is one binucleate neck canal cell, the wall always failing to develop. In the Hydropteridineae even the nuclear division fails to take place and there is only one small, uninucleate neck canal cell; while in the gymnosperms there is no neck canal cell at all. In some gymnosperms there is a ventral canal cell, separated from the egg by a wall; but in more cases there is only a nuclear division without the formation of a wall, and in Torreya even the nuclear division is suppressed. In the Gnetales we note the disappearance of even the archegonium. Recalling such a series, it is difficult to understand how anyone could propose such homologies as those suggested by PORSCH.—CHARLES J. CHAMBERLAIN.

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[17] PORSCH, OTTO, Versuch einer phylogenetischen Erklärung des Embryosackes und der doppelten Befruchtung der Angiospermen. Jena: Gustav Fischer. 1907.

[18] SCHAFFNER, JOHN H., On the origin of polar conjugation in the angiosperms. Ohio Naturalist **8**:255–258. 1908.